Flaw impulse response estimation in ultrasonic non-destructive evaluation using bi-cepstra

Yamani, A. (2007)

NDT & E International, 40 (1). pp. 57-61.

Abstract

Pulse-echo measurements in ultrasonic non-destructive evaluation (NDE) are masked by the characteristics of the measuring instruments, the propagation paths taken by the ultrasonic pulses, and are considered to be corrupted by additive noise. It is assumed that the measured pulse echo is obtained by linearly convolving the defect impulse response (IR) with the measurement system response. Deconvolution operation, therefore, seeks to undo the effect of this convolution and extract the IR which is essential for defect identification. Autocorrelation (or power spectrum) deconvolution techniques are limited to the identification of minimum-phase systems. In this work, we show that higher-order cepstra can be used to deconvolve the IR of the flaw from ultrasonic echo measurements (synthetic as well as real). We also demonstrate that a deconvolution based on the use of the bi-cepstrum gives lower identification error variance when compared with the results of Wiener filtering deconvolution, specially at low signal-to-noise ratios (SNR).